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## GEOGRAPHIC INTELLIGENCE REPORT

PARAGUAY

PART V: REGIONAL ANALYSIS OF THE CHACO



CIA/RR GR L-60-3, Part V

September 1960

**CENTRAL INTELLIGENCE AGENCY**

**OFFICE OF RESEARCH AND REPORTS**

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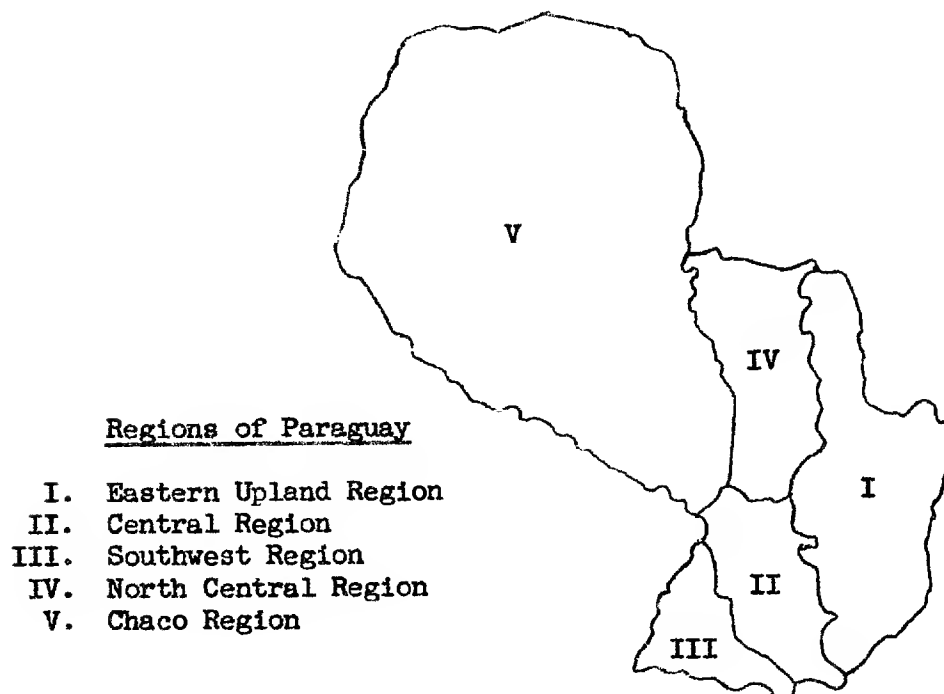
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PARAGUAY

PART V: REGIONAL ANALYSIS OF THE CHACO\*

I. General Orientation

The Chaco includes all of Paraguay west of the Paraguay River. Administratively the Chaco is divided into three departamentos -- Villa Hayes, Boquerón and Olimpo. The region is approximately 250,000 square kilometers (96,500 square miles) in areal extent, constituting the largest but least populated and least economically developed region of the country. (See sketch below, and map annex.)\*\*



\* The information in Part V of this report on Paraguay is based on the best sources available to this Office as of 1 September 1960.

\*\* The map annex is Part VI of this report.

II. Physical EnvironmentA. Terrain

The Paraguayan Chaco is part of the larger Chaco, a vast alluvial plain that slopes almost imperceptibly southeastward from the foothills of the Andes Mountains in Argentina and Bolivia to the Paraguay River. The average slope from west to east is less than 1 foot per mile. The surface is generally flat to undulating, broken only by a few isolated low hills in the northcentral part and by stream valleys and shallow depressions elsewhere. The land is very poorly drained and large areas are subject to inundation during the rainy season.

The southeastern Chaco -- south of 23° south latitude and east of 60° west longitude -- is the lowest part and has the only extensive system of permanent streams. The streams are sluggish and follow easterly and southeasterly meandering courses between banks seldom more than 1 or 2 meters (3 to 6 feet) high. The streams are generally bordered by floodplains with numerous oxbow lakes and marshy depressions and, beyond the edges of the floodplains, by other relatively low-lying plains that are seasonally inundated. At slightly higher elevations on the interfluves are the "high plains" or campos and the montes (forested lands), which lie above the normal flood level.

North of 23°S a similar stream pattern occurs within a zone 50 to 100 kilometers wide (30 to 60 miles) adjacent to the Paraguay River. In this zone, however, the general level of the land is higher; the interfluves are dry, and only the regular floodplains are normally subject to seasonal inundation.

Elsewhere in the Chaco permanent streams are few, but intermittent and discontinuous streams are numerous as are natural water courses without actual stream beds. In the southwestern part of the region the excess surface water that accumulates during the rainy season flows eastward along the ephemeral stream beds and water courses to the permanent streams of the southeastern Chaco and thence to the Paraguay River. The northwestern and northcentral parts of the Chaco have no external drainage. Here the excess water flows via intermittent streams and natural water courses to numerous depressions where it eventually evaporates or is absorbed.

The Pilcomayo River, which forms both the southern boundary of the Chaco Region and the international boundary between Paraguay and Argentina, is the only major stream of the region other than the Paraguay River. It follows a sinuous course along a narrow valley with well-defined banks from its headwaters in Bolivia to 60°50'W. Beyond this point the river has no permanent bed for some 150 kilometers (95 miles). It divides into branches, shifts channels frequently, and spreads its waters over an extensive swampy area called the Estero Patifio. The South Branch of the river constitutes the international boundary. It emerges at Salto Palmar (Palmar Falls; 24°22'S-59°27'W) as a narrow, well-defined stream flowing between vertical alluvial banks 5 to 6 meters (18 to 20 feet) high. The North Branch joins the South Branch at 24°56'S-58°18'W, and the reconstituted river flows southeastward to its junction with the Paraguay River at Puerto Pilcomayo (25°21'S-57°39'W). The Pilcomayo River is approximately 36 meters (120 feet) wide at its mouth. It overflows its banks during the rainy season when the water

level is highest, but may dry up completely during the latter part of the dry season in exceptionally dry years.

#### B. Soils

The Chaco soils are fine alluvial soils ranging from sandy loams to clay loams. For the most part they are relatively shallow soils underlain by an impervious clay subsoil. Many of the soils have a zone of salt accumulation that has formed because of the restricted subsurface drainage and the high evaporation-transpiration rate in the dry season. This is particularly true of the northern and western parts of the Chaco, where rainfall is least and evaporation greatest, and in depressions in the southeast, where soils are both shallow and poorly drained. In some areas the zone of salt accumulation is near the surface and the alkaline or saline soils support only salt-tolerant plants, such as coarse espartillo grasses. In general, the soils are deepest and best drained on the "high plains" and relatively shallow and poorly drained on the low plains and floodplains. Fingers of sandy soil occur in an area of the southcentral Chaco between Mariscal Estigarribia (22°02'S-60°38'W) and Fortín General Díaz (23°34'S-60°36'W). These long, narrow strips of sandy soil apparently mark the courses of former drainage channels.

In general the soils of the Chaco become very muddy and difficult to traverse during the rainy season. In the dry season the clouds of dust are an ever-present annoyance in cross-country movement.

#### C. Flora and Fauna

Except for the southeastern quarter of the Chaco (south of 22°S and east of 60°W) most of the region is forested. The forests vary



considerably in height and composition, becoming much more stunted and scrubby toward the west. In the southeastern Chaco are extensive areas of open grassland and palmares -- grasslands studded with individual black palms (carandaf) and palm groves -- as well as scattered forests (montes). Depending upon the depth and salinity of the soil, the grasses are either "sweet" or "bitter" (espartillo). In general, open grassland occurs on the floodplains and natural water courses, grassland and palmares on the low plains, and montes on the uncleared interfluvies or so-called high plains. Relatively large areas of forest have been cleared from the high plains in the southeast and along a zone adjacent to the Paraguay River in the northeast. The montes consist of thick brush forests of mesquite, cacti, and other thorny plants intermixed with palms and various hardwoods such as quebracho, lapacho and palo santo (holy wood). Away from the trails, the closeness of the trees, the presence of intertwining lianas, and the large number of spiny plants combine to make the montes almost impenetrable without the aid of a machete.

The vegetation of the swamps, or esteros, consists of reeds and cattails, with dense tangled woods near their margins and along the stream banks.

Land under cultivation is located primarily in the area of the Mennonite colonies in the central Chaco, and in scattered areas of the eastern Chaco near the Paraguay River.

The fauna common to the Chaco is similar to that of eastern Paraguay. The animals inhabiting the montes include the forest deer; the white-lipped and collared peccaries; the jaguar, puma, and ocelot; foxes;

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and various monkeys. The pampa deer, rabbits, a variety of wild guinea pig, and birds such as rheas, partridge, and pheasant are common to the palmares. Animals of the swamps and the woods along the margins of swamps and streams include the marsh deer, carpincho (a large rodent), tapir, coypu or nutria, otter, and crocodile, as well as thousands of ducks and other wild birds. Fish include the dorado, eels, and the vicious piranha.

Poisonous snakes are a constant danger; and insects are an ever-present nuisance.

#### D. Climate

The climate of the Chaco ranges from humid subtropical in the extreme southern part to tropical savanna in the central and northern parts. It is characterized in general by hot summers, mild winters, and a winter dry season.

The average annual temperature ranges from 23°C (73.4°F) in the southern Chaco to 25.4°C (77.7°F) at Bahía Negra near the northeast margin of the region (20°15'S-58°12'W). At Mariscal Estigarribia, in the central part of the Chaco, the mean maximum temperature for January, the warmest month, is 35.7°C (96.3°F), and the mean minimum temperature for July, the coolest month, is 13.4°C (56.1°F). The absolute maximum temperature recorded at Mariscal Estigarribia for the period 1940 to 1950 was 43.6°C (110.5°F), and the absolute minimum was -5.1°C (22.8°F).

The seasonal temperature characteristics are somewhat variable. The depressingly hot summer temperatures may be dispersed for a few hours or days at a time by a shift in the wind from north to south -- generally heralding a tropical storm. Similarly, periods of winter

cold may be interrupted by warm spells of several days duration when the wind shifts from the south to the northeast, blowing from the Brazilian Matto Grosso.

The average annual rainfall increases from west to east -- ranging from approximately 500 millimeters (20 inches) in the western Chaco to 1,300 millimeters (52 inches) in the extreme southeastern part. Marked wet and dry seasons occur, with maximum rainfall in summer, and a decided minimum rainfall in the period from May through September. An important aspect of the rainfall regime is its undependability; it varies considerably from the norm from month to month and from year to year. Occasionally a period of a month may pass during the dry season when no rainfall whatsoever is received. At Mariscal Estigarribia the amount of evaporation exceeds the amount of rainfall each month of the year. Most of the rain received falls in heavy showers, usually accompanying thunder storms. Long cloudy periods are rare, although heavy rains occasionally last several days. Because of the rapid surface runoff and lack of subsurface drainage, local flooding occurs after torrential rains.

The Pilcomayo and other permanent streams overflow their banks during the rainy season and inundate the swamps, floodplains, and low plains. Standing water may remain in depressions from December or January until May or June. The volume of the Pilcomayo increases rapidly in late spring with the melting of the snows at the headwaters in the Andes and with the onset of summer rains. After reaching its peak the volume gradually decreases until August, when the stream disappears almost completely.

The relative humidity decreases from east to west. At Puerto Casado near the eastern margin of the region the relative humidity is 74.8 percent for June, the most humid month, and 59.1 percent for August, the least humid month. At Mariscal Estigarribia the annual range is from 67.5 percent to 47.6 percent.

The dominant winds are from the north, the northeast, and the south. Normally, only light breezes blow during the day but high winds and dust storms occur relatively frequently.

Table 1

Characteristics of Climate  
at Bahía Negra, Paraguay, 1940-50

Month	Temperature (Degrees Fahrenheit)			Rainfall (Inches)	Evaporation (Inches)	Relative Humidity (Percent)
	Mean	Max	Min Average			
Jan	93.4	73.6	83.5	4.4	4.8	66.9
Feb	92.1	73.6	82.8	5.5	4.5	71.8
Mar	90.1	70.9	80.6	5.4	4.6	72.6
Apr	88.2	68.4	78.3	2.8	4.5	70.7
May	84.0	64.6	74.3	2.3	4.7	69.8
Jun	80.4	62.1	71.2	1.6	4.2	71.7
Jul	79.7	60.6	70.2	1.0	5.0	66.9
Aug	83.8	62.4	73.0	0.4	6.3	60.9
Sep	87.4	66.0	76.6	1.9	6.5	61.8
Oct	89.4	68.7	79.0	4.4	6.0	64.4
Nov	90.9	70.5	80.8	5.7	5.4	65.5
Dec	93.7	72.7	83.1	4.1	6.0	65.1

Characteristics of Climate  
at Mariscal Estigarribia, Paraguay, 1940-50

<u>Month</u>	<u>Temperature</u> <u>(Degrees Fahrenheit)</u>			<u>Rainfall</u> <u>(Inches)</u>	<u>Evaporation</u> <u>(Inches)</u>	<u>Relative</u> <u>Humidity</u> <u>(Percent)</u>
	<u>Mean</u>	<u>Max</u>	<u>Mean Min</u>			
Jan	96.3	71.6	83.8	4.6	7.3	53.8
Feb	94.3	71.6	82.9	4.3	5.8	60.1
Mar	90.3	68.0	79.2	3.8	5.3	64.1
Apr	86.4	63.5	74.8	2.6	4.8	64.9
May	81.7	60.4	71.1	1.4	4.9	67.5
Jun	77.5	57.0	67.3	0.9	4.4	66.7
Jul	78.6	56.1	67.3	0.5	6.2	58.6
Aug	84.7	59.0	71.8	0.4	9.0	47.8
Sep	88.0	62.2	75.0	0.9	9.1	47.6
Oct	90.7	65.7	78.1	3.6	8.2	50.4
Nov	93.2	67.8	80.4	4.4	7.0	52.9
Dec	95.7	70.0	82.8	3.1	7.9	52.0

Table 3

Characteristics of Climate  
at Puerto Casado, Paraguay, 1940-50

<u>Month</u>	<u>Temperature</u> <u>(Degrees Fahrenheit)</u>			<u>Rainfall</u> <u>(Inches)</u>	<u>Relative</u> <u>Humidity</u> <u>(Percent)</u>
	<u>Mean</u>	<u>Max</u>	<u>Mean Min</u>		
Jan	92.5	73.2	82.8	6.3	66.3
Feb	92.5	73.0	82.8	4.5	70.0
Mar	90.5	70.9	80.6	6.0	71.6
Apr	85.6	65.7	75.6	4.5	72.6
May	83.1	63.1	73.0	3.8	74.2
Jun	79.2	60.8	70.0	2.1	74.8
Jul	78.8	58.3	68.5	1.7	68.7
Aug	84.6	60.4	72.5	0.6	59.1
Sep	86.5	63.9	75.2	2.0	59.9
Oct	88.0	67.6	77.7	5.9	63.0
Nov	90.1	69.3	79.7	6.2	66.1
Dec	92.7	72.1	82.4	4.2	65.4

E. Water Supply

The supply of potable water is very limited in most of the Chaco. Since this extensive plain in the interior of the continent is not elevated much above sea level, there are no deep reserves of sweet water. A saline water table lies just below the impervious layer of clay that underlies the Chaco soils. The water table above the clay pan is sweet, consisting of rain-water seepage. In the dry season when surface streams dry up entirely, this subsurface supply of sweet water is largely depleted through horizontal seepage, evaporation, and transpiration.

The sandy soils area of southcentral Chaco, between Mariscal Estigarribia and Fortín General Díaz, has better-than-average supplies of sweet water. Rain water seeps into the old sandy stream beds characteristic of the area and collects in water pockets. Wells driven into this sandy strata to average depths of 9 to 10 meters (30 to 35 feet) generally tap sweet water. Care must be taken not to penetrate through the underlying clay pan to the salt water table, however, or the bitter water will contaminate the well.

In the southeastern Chaco, drinking water can be obtained from the permanent streams during most of the year. During the height of the dry season, however, supplementary sources must be found. As a precaution against drought, it is customary to build earthen cisterns to catch rain water both directly and from surface runoff. A shallow reservoir is scooped out of the soil and the sides banked up. In cattle country the bottom of the reservoir is generally paved with palm posts or hardwood logs to prevent cattle from turning it into a

mudhole. As with wells, care must be taken not to dig through the underlying clay pan and so permit bitter water to seep through.

Elsewhere in the Chaco where neither permanent streams nor old sandy stream beds exist, earthen cisterns are frequently the only satisfactory source of supply. Bottle trees (palos borachos) and other water-retaining plants grow in the arid western part of the Chaco, but often have little or no stored water in the latter part of the dry season.

All drinking water should be purified as a precautionary measure.

### III. Population

#### A. Distribution

The Chaco is the least populated region of Paraguay. Although it comprises 61 percent of the total area of the country, it has only about 4 percent of the population. The rural population density is a little higher in the south than in the north but the entire Chaco averages only 0.1 persons per square kilometer (0.4 persons per square mile).

The urban population of the region, as enumerated in the 1950 census, is very small. Puerto Pinasco (22°43'S-57°50'W), on the Paraguay River, with a population of 3,457 is the largest town. Six other towns had from 1,000 to 3,000 inhabitants in 1950, and all of them except Mariscal Estigarribia were located at the eastern margin of the Chaco, near the Paraguay River. There were no towns within the intermediate population category (500 to 1,000); and only 5 towns with fewer than 500 inhabitants. Of these, only 3 -- administrative centers of the 3 Mennonite colonies -- were located in the interior of the Chaco.

The Mennonite colonies of the southcentral Chaco actually consist of many small rural villages located in relatively close proximity. Colonia Mennonita (22°30'S-60°00'W) has 53 such villages; Colonia Neuland (22°45'S-60°05'W) has 24; and Colonia Fernheim (22°20'S-60°00'W) has 20. Filadelfia (22°21'S-60°02'W), the administrative center of Colonia Fernheim, is the only sizable town in the area.

In the census enumeration, the scanty population of the numerous cattle estancias (ranches), small Paraguay River ports, military outposts (fortines), and temporary Indian villages was included with rural population figures.

#### B. Ethnic Groups

Almost three-fourths of the Chaco population was indicated in the 1950 census as being of Paraguayan racial stock -- a Guaraní-Spanish mixture. Ten percent were listed as Mennonites and 16 percent as native Indians; small numbers of Argentinian and Brazilian settlers were also included. Although the census indicates a total Indian population of approximately 10,000 persons, other sources roughly estimate it to be as large as 68,000. The nomadic habits of many of the tribes and the inaccessibility of large areas of the Chaco make it almost impossible to get an exact census enumeration.

The Paraguayans are located in the eastern half of the Chaco with the principle concentrations in a zone 50 to 100 kilometers (30 to 60 miles) wide along the Paraguay River, and in the Departamento de Presidente Hayes, in the southeastern Chaco. Altogether the Mennonite colonists own approximately 5,440 square kilometers (2,100 square miles) of land -- an area about the size of the state of Delaware -- in the southcentral Chaco, around Filadelfia.



The Indian tribes are scattered throughout the Chaco. In the eastern part many have settled down and either work on the ranches or in the quebracho forests operated by the Paraguayans. Some cultivate their own farm plots and tend communal herds of cattle. In much of the western and extreme northern Chaco, however, the Indians still lead nomadic lives and rely on hunting and fishing for sustenance. Of the numerous tribes represented in the Chaco, only the Moros of the relatively unexplored northern part are considered hostile.

The languages most commonly spoken among the Paraguayans in the Chaco are Spanish and Guaraní. Slightly more than half of the people speak both Spanish and Guaraní, and about one-fourth speak Guaraní only. A small percentage, 6 percent, speak Spanish only. The Mennonites speak their own dialect of German. Many of the Indians in the eastern Chaco now speak Guaraní, but the tribes in more remote areas presumably speak their own dialects.

### C. Sanitation and Health

As elsewhere in Paraguay, only the most primitive sanitation practices are observed in the Chaco, and few doctors or medical facilities are available. The most prevalent contagious diseases are malaria, ancylostomiasis (hookworm), typhoid fever, diphtheria, and chicken pox. Goiter is prevalent in some areas, and trachoma has been a health hazard in the Mennonite colonies.

The Social Security Agency operates small hospitals at Puerto Guaraní (21°18'S-57°55'W), Puerto Sastre (22°06'S-57°59'W), Puerto Casado and Puerto Pinasco (22°43'S-57°50'W), and the Military Health Service has a 50-bed hospital at Mariscal Estigarribia. Well-equipped

hospitals are maintained at the administrative centers of the three Mennonite colonies.

#### IV. Civil Government and Military Centers

The only significant civil government centers in the Chaco are Villa Hayes (25°06'S-57°34'W), Mariscal Estigarribia and Fuerte Olimpo (21°02'S-57°54'W) -- the capitals of Presidente Hayes, Boquerón, and Olimpo departamentos, respectively.

As of October 1959, Mariscal Estigarribia was the headquarters for the Military Territory of the Chaco. The 6th Infantry Regiment and the 7th and 8th Engineer Battalions were located there. The extreme southern part of the Chaco falls within the First Military Region; in 1959 the Pilcomaya Cavalry Detachment was located at Colonia Benjamín Aceval (24°58'S-57°54'W) and the 3rd Engineer Battalion at Villa Hayes.

The only military airfield in the Chaco is located at Mariscal Estigarribia. It has 2 rolled-earth runways, each measuring 3,930 feet by 150 feet. The airfield is operated by the Paraguayan Army and is used by Transportes Aereos Militares, the military air transport line. Although of significance for support of the military territorial headquarters at Mariscal Estigarribia, the operational capabilities of the airfield are limited by a lack of hard-surfaced runways and adequate servicing facilities.

#### V. Transportation

##### A. Roads

There are no all-weather roads in the Chaco. The few improved dirt roads are surfaced with compacted clay and become very muddy and slippery when wet.

An official Trans-Chaco highway (Ruta Trans-Chaco) is under construction between Villa Hayes and Filadelfia. Eventually it will continue beyond Filadelfia to the Bolivian border at Cañada Oruro (21°40'S-62°24'W). As of 25 March 1960, some 97 kilometers (40 miles) of this highway had been completed northwestward from Villa Hayes and 34 kilometers (20 miles) had been completed southeastward from Friedensfeld -- a village 12 kilometers (7 miles) southeast of Filadelfia. The road does not have a rock base. It is being constructed of compacted soil and clay, and is being surfaced with clay. It will be slippery when wet and potholed in dry weather. Although it can be leveled and resurfaced easily by a bulldozer, it can hardly be called an all-weather road. The Ministry of Public Works operates a ferry -- a small flat barge with a capacity of three passenger cars -- across the Paraguay River at Villa Hayes, linking the Trans-Chaco highway with the road to Asunción.

Several good fair-weather dirt roads have been constructed in the central Chaco. One extends from Filadelfia northeastward to End Station (kilometer 145 on the Railway Carlos Casada Limitada). End Station serves as the railhead for the Mennonite colonies. Another road extends from the terminal point of the railway (kilometer 160) westward to Mariscal Estigarribia. Filadelfia and Mariscal Estigarribia are also connected by a direct road that continues on northwestward to Fortín Coronel E. Garay (approximately 20°30'S-62°08'W), near the Bolivian border. Although other seasonal dirt roads exist, their present condition is unknown.

Recently, the Williams Brothers Corporation, a US firm, built over 500 kilometers (300 miles) of roads in the northern Chaco for the Pure Oil Company, complete with drainage ditches and bridges of 70-ton capacity. As a result of having no maintenance during 1960, however, the roads reportedly in 5 months had become overgrown by brush and trees up to 2 inches thick and 7 feet high.

The eastern half of the Chaco has many cart tracks, and there are foot trails throughout the region.

#### B. Railroads

As of May 1959, there were four short industrial railroads extending from the Paraguay River westward into the quebracho forests of the Chaco. The longest line, Carlos Casado Limitada, extends from Puerto Casado 165 kilometers (100 miles) westward into the interior of the Chaco. It serves the Argentine quebracho extract company of Carlos Casado Limitado, as well as the Mennonite colonies and the military garrison at Mariscal Estigarribia via connecting roads. The trains are mixed, including both freight and passenger cars.

The International Products Corporation operates an industrial railway line extending from Puerto Pinasco 69 kilometers (43 miles) westward into its quebracho forests. The industrial concern, Campos y Quebrachales de Puerto Sastre, S.A., operates a line extending 90 kilometers (56 miles) westward from Puerto Sastre, and Sociedad Forestal de Puerto Guaraní, S.A., operates a railway westward 74 kilometers (46 miles) from Puerto Guaraní. The latter company was in bankruptcy as of May 1959, and it is doubtful that its railroad will ever operate again.

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Several official Paraguayan maps show a very short railroad line extending westward from Puerto Palma Chica (21°47'S-57°54'W). It is doubtful that this line is in operation since the port is practically inactive and its floating wooden dock no longer exists.

### C. Waterways

The Paraguay River serves as the principal transportation artery for the Chaco. The traffic consists mainly of self-propelled vessels having drafts ranging from 4 to 9 feet (1.2 to 2.7 meters) and by towed cargo vessels drawing as much as 11 feet (3.3 meters) when fully loaded. Most of the vessels navigating in this section of the river draw less than 7 feet (2.1 meters) and have gross tonnages of less than 500 tons. For relatively short periods when the river is low -- late September to January -- vessels have to be loaded for less than a 7-foot draft.

The ports along this section of the river are small and only Puerto Pinasco, Puerto Casado, Puerto Sastre, and Puerto Guaraní have any permanent port facilities. Puerto Pinasco has 2 hardwood wharves and several steam cranes for handling quebracho extract and other forest products; Puerto Casado also has 2 hardwood wharves equipped with steam cranes -- 1 wharf for handling quebracho extract and 1 for passengers; Puerto Sastre has 1 hardwood wharf and a steam crane for handling quebracho extract; and Puerto Guaraní has 1 cargo wharf equipped with a steam crane and 1 passenger wharf. At most of the other Chaco ports -- for example, Villa Hayes, Fuerte Olimpo, Bahía Negra and Puerto Caballo -- vessels either tie up directly to bluff banks or load and unload by means of small boats.

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At high-water level the Pilcomayo River may be navigated upstream for 200 kilometers (124 miles) by vessels of 3-foot (1-meter) draft. The river is subject to water-level variations of as much as 9 meters (29.5 feet) between low-water and high-water periods. In low water the controlling depth may be as little as 0.2 meters (0.7 feet).

#### D. Air

There are 3 airfields in the Chaco that have runways 2,000 feet or more in length. The Mariscal Estigarribia airfield is a military airfield used by Transportes Aereos Militares (T.A.M.) for DC-3 aircraft and smaller planes. It has 2 rolled-earth runways 3,930-feet long. The airfield at Puerto Pinasco has 1 sod runway 4,200-feet long, which is used jointly by T.A.M. and Linea Aerea de Transporte Nacional (L.A.T.N.). It is the only airfield in the Chaco having a navigational aid -- an air-ground (voice) radio beacon. An airfield at Puerto Casado that has a 3,000-foot hard-packed dirt runway is used by L.A.T.N.

Operational airfields with runways less than 2,000 feet in length were reported in 1957 and 1958 at Bahía Negra, Filadelfia, Fortín Juan de Zalazar (23°05'S-59°17'W), Fuerte Olimpo, and Puerto Guaraní. No data are available concerning the facilities and present operational status of these airfields.

#### VI. Telecommunications

A main telegraph line extends northward from Concepción to Bahía Negra, serving nearly all of the intermediate towns located along the Chaco side of the Paraguay River. Another short telegraph line extends from Asunción to Villa Hayes and Colonia Benjamín Aceval by way of Limpio (25°11'S-57°32'W). Radio-telegraph centers are located at Puerto Pinasco and at Mariscal Estigarribia.

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The administrative centers of the Mennonite colonies are interconnected by telephone. This network is connected with Mariscal Estigarribia via the Isla Poi (22°30'S-59°44'W)-Mariscal Estigarribia military telephone line.

Local telephone networks, to some extent interconnected, are reported at the following ports: Puerto Pinasco, Puerto Casado, Puerto Sastre, Puerto Guaraní, and Fuerte Olimpo.

The Fernheim Mennonite colony operates a shortwave radio -- presumably at Filadelfia. Data are not available concerning other privately operated shortwave radios, but it is likely that the military headquarters, the more important ports, and many ranches are equipped with them. There are no commercial broadcasting stations in the Chaco.

#### VII. Economic Development

The principal economic activities of the Chaco are cattle raising, agriculture, and forest exploitation.

As of 1952, 40 percent of the cattle of the country were raised in the Chaco. Cattle estancias are scattered throughout the eastern Chaco with a particular concentration in the southeast. Holdings there are large and permit the extensive kind of ranching that is necessary on the poorly watered range.

General and subsistence farming predominate in the Chaco. The Mennonite agricultural colonies in the central Chaco constitute the main agricultural zone, although small numbers of farms are scattered throughout other parts of the Chaco -- particularly in the southeast near the Paraguay River. The principal cash crop is cotton, although sorghums, mandioca, beans, sweet potatoes, peanuts, and various fruits

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are commonly grown. Sugarcane and rice are becoming increasingly important in the southeastern Chaco. In general, agriculture is limited by inadequate transportation facilities and a lack of assured markets.

In a region including about 10 million acres adjacent to the Paraguay River between Puerto Pinasco and Puerto Guaraní, the exploitation of quebracho forests for quebracho extract (tannin) is an important economic activity. Four large companies have handled most of the quebracho. They operate tannin plants at Puerto Pinasco, Puerto Casado, Puerto Guaraní and Puerto Sastre. As of May 1959, however, the Sociedad Forestal de Puerto Guaraní, S.A., was in bankruptcy, and it probably will cease activities in the Puerto Guaraní area. Other forest activities include the export of lumber and logs; the extraction of palo santo oil from the palo santo (holy wood) tree; and experimentation with the extraction of wax from the carandá palm.

The manufacturing industries of the region, located primarily at the larger ports and at the Mennonite colonies, are based on the processing of raw materials from the ranching, agricultural, and forestry enterprises. They consist of a few tanneries, cotton gins, vegetable-oil mills, sawmills, tannin factories, and a sugar refinery.



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